HEAD INFECTION CAUSED BY A NEW HEMISPORA: H. COREMIFORMIS[1]

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INTRODUCTION

Hemisporosis, as a clinical entity, has been established since 1909, when Gougerot and Caraven ('09) cultured an organism from fragments of an infected tibia. It resembled and was at first diagnosed as a syphilitic periostitis, but was found to be an osteo-periostitis. Later cultural studies (Gougerot and Caraven, '10) on various media proved that the organism was similar to *Hemispora stellata,* a species which Vuillemin had isolated from *Aspergillus repens* and had described in detail (Vuillemin, '06). Since then Castellani has isolated another species, *Hemispora rugosa,* from cases of bronchitis and tonsilitis and from the vulva (Castellani, '25). He also described a third species, *H. pararugosa* Castellani, Douglas and Thompson, but stated that it was probably only a variety of *H. rugosa.*

The disease was later confirmed by several writers, notably Auvray ('09), who described a gummatous infection or infiltration of the neck and face. De Beurmann, Clair, and Gougerot ('09) reported a case which showed cold abscesses of the penis, and there have also been cases of nasal involvement, cheek infections, and subcutaneous ulcerating gummas on the back (Balzer and Belloir, '13). Porcelli ('22) found an infection of the nose, the first case of hemisporosis from Italy. Other cases have been reported, but since the literature has been summarized (Grütz-Elberfeld in the Handbuch der Haut- und

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Geschlechtskrankheiten, '28), a complete review here would be unnecessary.

The organism described in this paper, morphologically, culturally, and physiologically, was isolated from an infection of the head by Peña Chavarria of Costa Rica. An abstract of the case, which is in press, in the Archiv für Schiffs- und Tropenhygiene, Hamburg, was kindly sent the author by Chavarria.

CASE REPORT

M. A. V., a farmer, 34 years of age, living at Turrialba (Atlantic slope), a region from which a patient with a similar infection had been treated six years previously. Patient entered the hospital on June 13, 1932, with an infection due to scratching bee bites with soiled hands. A small vesicle formed at the center of his forehead, which when scratched exuded a clear liquid. He received medical treatment quite early (injections of Antimosan, an antimony preparation), but new lesions which followed the course of the former one appeared on his forehead, back of the neck, and on the upper extremity of the right ear.

The patient showed no history of syphilis or tuberculosis, but of several of the tropical, parasitic diseases, including malaria. Wassermann negative.

The patient is well-built, in a good state of health on a general physical examination. The skin infection, however, shows a large lesion on his forehead, 4 x 5 inches, with the surface and edges slightly raised and irregular. The color is brass red, simulating a syphilitic lesion. The tissues are infiltrated, with no pain to the touch. There is an occasional pruritus. Along the left eyebrow there are four elements which tend to evolve as did the other on the forehead. On the edge of the right ear there are several small papulo-verrucoid lesions, some of which show suppuration. There are also lesions on the angle of the right jaw. Scars on the clavicular region of the same side correspond (according to the patient's statements) to the above lesions. Repeated examinations of material from the lesions showed always yeast-like organisms.

The patient was treated with iodine and tartar emetic intravenously and antiseptics locally, with healing resulting in two months.

TECHNIQUE

Cultural studies were made of the organism from a fairly wide variety of substrates. The morphology was studied in distilled water mounts, in Amann's lacto-phenol, and mounts in crystal violet in glycerine (1 per cent crystal violet to the desired intensity in glycerine). Details of the cellular and spore development were observed from hanging-drop and slide mounts in 2 per cent bacto-peptone, lactose broth (Difco), and beef extract broth (Difco).

DESCRIPTION

The microbe studied was obtained on a Sabouraud's glucose agar slant, growing as a yeast-like organism and appearing culturally as a vermiculate growth. The parasite exists in the host as a yeast-like organism with budding cells (pl. 9, fig. 1) 4–6 μ in diameter. These cells are thick-walled and appear double-contoured. When transferred to an artificial substrate they elongate to form sclerotic cells, simulating germinating spores (pl. 9, fig. 1). The organism exists in this state for a variable length of time, depending on the medium in which it is grown, the temperature, and other growth factors.

With repeated subculturing in most cases of yeast-like organisms, it is possible to obtain a filamentous type of fungus. In this case, the microbe was subcultured twice, and showing no appreciable change morphologically or culturally, was stored in the ice-box for approximately five months. It was then subcultured twice, after which it underwent several changes, physiologically and morphologically. This development may be attributed to the adaptation of the organism to a saprophytic form of life on the artificial medium. The reaction involved, in addition to the different substrate, a changed pH, nitrogen and carbohydrate source.

On most media the cells elongate to form long filamentous hyphae (pl. 9, figs. 2, 10). The cells may be long and thin, or short and narrow (pl. 9, fig. 35), or they may be thick (pl. 9, fig. 36). On the other hand, the mycelium may consist of simple or branched chains of yeast-like cells simulating oidia or arthrospores as on Richards' (pl. 9, fig. 21) and Raulin's agar (pl. 9, fig. 22), or there may be combinations of both types (pl. 9, fig. 28; pl. 10, fig. 73). On wort agar, a medium which is particularly adapted to yeast cultivation, the organism develops, in addition to cylindrical cells, spherical or ovoid structures with a heavy gelatinous wall or envelope, from which the cell either grows or slips out (pl. 9, fig. 19; pl. 10, figs. 51–52, 54–59, 61–62, 66, 68, 70). This type of structure is also evident on malt-extract agar (pl. 9, fig. 26) which is a modification of wort agar.

With the formation of hyphae, which may vary from 2 to 4 μ in diameter, there are formed also intercalary chlamydospores (pl. 9, fig. 9) either spherical, 6–10 μ in diameter, or ovoid or elongate, 7–9 × 12–15 μ or larger. Usually, however, there may be seen, in mounts of mycelium, large spherical cells (pl. 9, fig. 32) floating freely. On wort agar, large cells 6–17 μ in diameter (pl. 10, fig. 51) are in abundance. Conidia (pl. 9, fig. 9), usually pyriform, at times spherical, 4–6 μ in diameter, are found frequently and germinate (pl. 9, figs. 23–25) to form hyphae. Blastospores (pl. 9, fig. 10; pl. 10, fig. 73) are also found.

The formation of the hyphae is further emphasized by the production of spherical, globose or sub-clavate to clavate cells at the apex of the filament (pl. 9, figs. 26–30, 33–34; pl. 10, figs. 37–38, 41–44, 49–50, 60, 63–64, 68–69, 72–73). These cells may also be ampulliform (pl. 10, figs. 45–46) and Vuillemin considers them to be protoconidia or hemispores which later divide to form several spore-like cells termed deuteroconidia. In the growth of the filament, cross-walls are laid down much as in the arthrospore-producing organisms, which accounts partially for the systematic position of the fungus and also for its confusion with other genera.

The hyphae may branch and give rise to several filaments which undergo the same process of laying down cross-walls by a growth inward of the cell wall. The formation of the primary partitions is followed by that of secondary walls which form the catenulate conidia or arthrosporous cells (pl. 10, fig. 37). These cells, which vary in number and size, are formed by an almost simultaneous cross-wall production. They are usually preceded by a thickening of the filament wall, giving the appearance of a constriction, so-called by Vuillemin and Castellani (pl. 9, figs. 30, 34; pl. 10, figs. 44, 50). Where there are a number of adjacent branches, coremia are formed (pl. 10, fig. 70), with large heads of many of the arthrosporous spherical or ovoid cells. The presence of coremia is noted on most solid media, but not in liquid substrates.

The cells of the filaments, as stated above, may be arthrosporous, spherical, cylindrical, or ovoid. In addition, there are

sections of the hypha which are thin-walled and have no apparent cellular material (pl. 9, figs. 14, 19–20, 26–30; pl. 10, figs. 38, 41–50, 70, 72–73). This makes the intercalary cells appear as isolated chlamydospores, comparable to akinetes in the algae as pointed out for *Geotrichum* in a previous paper (Moore, '34).

When the partitions are finally laid down the cells mature rapidly, and the last step in their cycle consists of the formation of echinulate spores. The spores develop on filaments or hyphal branches, as do conidiospores, and the carriers of these cells have been termed conidiophores. Such a terminology would place the organism in the Conidiophorales as has already been done. There is apparently no sexuality here. The confusion, however, is due to the fact that the resulting spores appear to be formed in a manner which would take them from the above group, the Fungi Imperfecti, and place them in a better-known division of fungi, the Ascomycetes. This change is subject to the further investigation of the organism.

Vuillemin observed a thickening and granulation of the external spore wall which makes the spore appear dark. Here, the dark echinulate spore develops from within the cell (pl. 10, fig. 65). When mounted in a lacto-phenol preparation or some aniline dye, the internal cytoplasm appears as a much-thickened and darker-staining material surrounded by a faintly staining cell wall. As the spore matures it becomes thicker, showing small striations which at first appear as deep corrugations, and later developing fine prickles. In the meantime the cell wall degenerates, becomes irregular, loses its consistency and finally is devoid of life. At this time it is a disintegrating brownish material (pl. 10, fig. 74). The fine prickles are now more apparent and finally develop into small spines. At times the hemispores may sporulate simultaneously (pl. 9, fig. 26), so that two spores may appear attached (pl. 10, fig. 66). However, the usual procedure consists of the dispersal and production of these structures at the apex and proceeding down towards the base of the hypha. The type of spore development is highly suggestive of uni-spored asci and the hypha may then be called ascogenous. Further evidence will be derived from

cytological investigations now in progress. In coremia the developing spores simulate roses in a bouquet, and the whole structure, superficially, appears like that found in *Briosia* of the Phaeostilbaceae of the Fungi Imperfecti.

CULTURAL DESCRIPTIONS

The organism presented a yeast-like appearance at first, but after repeated subculturing and storage in the ice-box, the morphology was changed. This suggested an adaptation to a saprophytic mode of life, and consequently it was decided to grow the microbe in a number of different media. These substrates form a general list commonly employed in examination of fungi and involve a range of hydrogen-ion concentrations, different amounts of protein or protein decomposition products as peptones, and also varying amounts of carbohydrate and nitrogen.

The following media used for the description of the organism are arranged in the order of decreasing concentration of hydrogen ions. All cultures were grown at approximately 25° C.

Raulin's Agar (pH 4.1).—Colony submerged in agar and seen only by allowing a light to pass through the medium. Diameter approximately 3.5 cm. after 32 days. Chains of cells spherical to ovoid, 5–6 μ in diameter; coremia with slightly elongated cells 4 × 6 μ, and elongated cells 4–6 × 7–9 μ; long narrow hyphal cells 3 × 15 μ; large spherical cells 9 μ in diameter; chains of cells somewhat cylindrical, terminating in a spherical or ovoidal cell approximately 7 μ in diameter.

Richards' Agar (pH 4.3).—Colony submerged as above, showing the branched growth with a diameter of approximately 3.5 cm. after 32 days. Cells in chains, spherical to ovoid, 6–8 μ in diameter; cylindrical cells in series, 4 × 9 μ, thick-walled or double-contoured; many young filaments tapering off from a series of yeast-like cells, to longer finer cells of a smaller diameter, 2–3 μ; filaments of cells with the ultimate structure thick-walled, enlarged, and showing a cross-wall to form 2 hemispherical cells.

Czapek's Agar (pH 4.4).—Colony as above, diameter 4 cm. after 32 days. Chains of cells; round cells 4–8 μ; elongated

ovoid cells 3–4 × 7–9 μ, arthrosporous; series of subclavate cells with ultimate cell approximately 6 μ in diameter.

Wort Agar (Product of Digestive Ferments Co., pH 4.8).—Colony vermiculate, heaped up, light cinnamon in color, approximately 2 cm. in diameter after 32 days. Growth mucoid, thick and tenacious. Many large yeast-like cells 6–8 μ in diameter, with a thick gelatinous or mucilaginous sheath enlarging the cell diameter to 8–15 μ; coremia of bundles of chains of cells 3–4.5 μ in diameter, 7–21 μ in length. Gelatin-encased cells borne at tips of filaments in short chains, developing from hemispores or partitioned-off cells by a process simulating arthrospore formation. Blastospores approximately 6 μ in diameter; large spherical thick-walled cells (intercalary) approximately 10 μ in diameter; ovoid cells 8–9 × 12–14 μ; echinulate spores approximately 5 μ in diameter.

Malt Extract Agar (pH 5.2).—Colony vermiculate at periphery and center with radiate creamy-buff to yellow ridges. Culture heaped up at center, point of inoculation approximately 3 cm. in diameter after 32 days. Chains of spherical cells approximately 10 μ in diameter. Mucoid secretion present, but not in such great abundance as above. Characters otherwise similar to those on wort agar.

Sabouraud's Agar (pH 5.6).—Colony cerebriform at point of inoculation with a coremiform, vermiculate ring of growth a short distance from the center, merging into a flat growth. Color that of medium, creamy-buff to amber. Diameter approximately 5 cm. after 29 days. Coremia of chains of cells 3–4 × 8–20 μ; elongate blastospores 4 × 6 μ, spherical 5 μ in diameter; large clavate cells terminal on filaments; elongated unicellular filaments and sclerotic cells 3 μ in diameter; many budding spherical cells approximately 6 μ in diameter; echinulate dark spores approximately 5 μ in diameter.

Sabouraud's Broth (The above minus the agar).—Organism in flakes and groups of cells at bottom of flask. Chains of cells as above; no coremia; spherical cells 4–15 μ in diameter; arthrosporous cells 4 × 6 μ; hyphae of long cells 4 × 30 μ; echinulate spores approximately 5 μ in diameter.

Corn-Meal Agar (Product of Digestive Ferments Co., pH

6.0).—Growth similar to that on Richards' agar except for a finely visible surface formation. Colony approximately 3.5 cm. in diameter after 32 days, color light Isabella. Thick-walled spherical cells in chains, 8–10 μ in diameter; arthrosporous cells 4–6 × 6–10 μ, many cells of varying dimensions; hemisporous clavate cells 7–10 × 15–18 μ; hyphae 3–4 μ in diameter.

Potato-Dextrose Agar (pH 6.2).—Colony 6 cm. in diameter after 32 days, with many radiate branched cerebriform striations or grooves from a highly peaked center. Color creamy-buff. Coremia present; hyphae 3–4 μ in diameter; chains of spherical cells 5–6 μ in diameter, and arthrosporous cells 4 × 6–8 μ; large cells 12–17 μ in diameter; clavate triseptate cells 12–15 × 15–18 μ; hemisporous clavate cells 9 × 15 μ; elongated cells 4–6 × 6–15 μ, in chains; citriform to subovoid cells 4–6 × 6–8 μ; sclerotic cells numerous, as well as racquet or clavate cells in short chains.

Lactose Broth (Product of Digestive Ferments Co., pH 6.8).—Macroscopic appearance similar to that in Sabouraud's broth. Chains of spherical cells 5–6 μ in diameter, occurring terminally on filaments. Cells catenulate, simulating those found in *Oospora;* hyphae approximately 3 μ in diameter; spherical terminal cells 9 μ in diameter; clavate hemisporous cells 7 × 12 μ; conidium-like cells 6–9 μ in diameter, somewhat pyriform to ovoid; intercalary spherical cells 6–8 μ in diameter.

Lactose Agar (The above plus 2 per cent agar).—Colony raised and convolute in center, with radiate striations to periphery, approximately 5 cm. in diameter after 32 days. Cells in chains as in broth; fine coremia appearing hyaline to white on surface, consisting of spherical, subovoid and arthrosporous cells; hyphae 3 μ in diameter; echinulate spores approximately 5 μ in diameter, appearing black with lacto-phenol (cotton blue).

Nutrient Agar (Product of Digestive Ferments Co., pH 7.0).—Colony flat except for a slightly raised center, approximately 4 cm. in diameter after 32 days. Culture appears asteroid or stellate, color that of medium. Hyphae 4 μ in diameter; terminal spherical cells approximately 6 μ in diameter; terminal clavate hemisporous cells and intercalary spherical cells; large

spherical cells 10–12 μ in diameter; cells in chains, 6–8 μ in diameter. General characteristics similar to those on lactose agar.

Glycerine Agar (Nutrient agar plus 6 per cent glycerine, pH 7.0).—Cultural appearance similar to that on potato-dextrose agar. Very fine prickles on surface of colony, coremia. Colony approximately 4 cm. in diameter after 32 days. Color creamy-buff, with a hyaline sheen. Hyphae 3–4 μ in diameter; many large multi-septate filaments 5–7 μ in diameter; conidium-like cells approximately 5 μ in diameter; clavate cells, di- and tri-septate, 9–12 μ in diameter; large cells 9 μ in diameter; small spherical cells 4–7 μ in diameter; cells of filaments 4 × 12 μ; arthrosporous cells 4 × 8–9 μ. Many clumps of cells 6–7 μ in diameter held by a gelatinous matrix; clavate hemisporous cells 9 × 12–15 μ.

Serum Agar (Nutrient agar plus 1 per cent bacto-beef blood serum, pH 7.2).—Colony macroscopically simulates that on nutrient agar except for the greater number of radiations or ridges. Diameter approximately 3 cm. after 32 days. Color creamy-buff to amber. Cells of filaments approximately 6 μ in diameter; terminal cells 7–8 μ in diameter; hyphae 3–4 μ in diameter; ovoid cells 4 × 7–8 μ; many small spherical cells approximately 4 μ in diameter. Cells in general seem to be in a simple yeast condition due perhaps to the serum in the medium.

Endo's Agar (Product of Digestive Ferments Co., pH 7.5).—Culture macroscopically similar to that on glycerine except that here the mycelium has taken up the red dye of the medium. Diameter approximately 3.5 cm. after 32 days. Characters similar to those on Sabouraud's agar.

Gelatine (Beef extract broth plus 10 per cent bacto gelatine).—Liquefaction starts on twelfth day at surface and proceeds downward.

Litmus Milk.—Acid and curdling start on the third day and are complete on the seventeenth day.

Carbohydrate Reactions.—Acid and no gas production with l-arabinose, l-xylose, glucose, galactose, d-mannose, levulose, lactose, maltose. No acid or gas, but an alkaline reaction with rhamnose, saccharose, raffinose, amygdalin, and salicin.

DISCUSSION

The genus *Hemispora* was created by Vuillemin in 1906, with a single species *stellata,* so called because of the presence of star-like growths on *Aspergillus repens.* The surface of the organism was powdery and the whole growth was brown in color. On microscopic examination, the powder or dust was found to be a mass of spores. The microbe was later found in a number of conditions existing as a saprophyte. As a parasite the fungus or a closely related organism has been isolated from a number of cases which resembled clinically sporotrichosis, and the cultivation of the microbe was required in order to arrive at a better diagnosis.

On the basis of the type of spore formation, that is, the production of branches of hyphae which have at their apex a large cell termed a protoconidium or hemispore, the fungus was classified with the Conidiophorales. The protoconidia give rise almost simultaneously to cells which approximate each other in size and are termed deuteroconidia.

Several years after Vuillemin's classification and identification of *Hemispora stellata,* Castellani in 1910 isolated a new species, *H. rugosa,* from cases of bronchitis and a case of tonsillitis. This organism differs from the former in the type of cultural growth, which is abundant on glucose agar, crinkled, and at times cerebriform. The color varies from amber to brown. The main difference, according to Vuillemin, seems to be that it grows in gelatine and liquefies it slowly, while gelatine liquefaction is negative with *H. stellata.* Milk is not changed generally, but may be somewhat peptonized with a small coagulum. The sugar reactions are as follows: acid with saccharose, glucose, arabinose and levulose, and doubtful for maltose; no acid with lactose, dulcite, mannite, dextrin, raffinose, adonite, inulin, starch, salicin, galactose, and glycerine. Litmus milk is negative.

A third species, *H. pararugosa* Castellani, Douglas and Thompson, mentioned by Castellani ('25), differs from *H. rugosa* in being a rapid liquefier of gelatine. This organism may be only a variety of the former, or perhaps identical with

that species. It is generally recognized, however, that both species are unlike *H. stellata,* and Ciferri and Redaelli ('34), in a foot-note, make the following statement: "*Hemispora rugosa* Cast. and *H. pararugosa* Cast., Douglas and Thompson, are *Trichosporon- (Trichosporum-)* like fungi, in no way comparable to *Hemispora stellata,* in spite of the strange affirmation of Vuillemin (1931) that the differences pending [sic] on the liquefaction of gelatine."

These two authors in the same paper, which is a summary of a paper dealing with a comparative study of twenty-one strains of fungi referred to as *H. stellata* Vuill., *Oospora d'Agatae* Sacc., *Torula sacchari* Corda, etc., place the genus *Hemispora* in synonymy with the genus *Sporendonema* of Desmazières (1827). Although the type species of the latter genus should be *S. casei* (Desmazières, 1827), they create a new combination with the species *Torula epizoa* Corda, *Sporendonema epizoum* (Corda) Ciferri and Redaelli, and establish that as the type species.

In spite of the elaborate description and combination by these two authors, it seems that the interpretation of previously existing genera is almost purely personal. On the other hand, it is difficult to compare favorably the generic characters based entirely on morphologic features with the structures existing in Vuillemin's *Hemispora.* It is very easy to assume similarities, but genera cannot be based entirely on assumptions especially if the diagnostic features are lacking. The author is satisfied that the genus *Sporendonema* shows insufficient similarity in characteristics to replace *Hemispora.* Further, there is no apparent certainty that the fungus originally described by Vuillemin was the one which these or other authors have been able to obtain for comparison. In addition, because of the type of spore production which suggests itself as ascogenous, the genus *Hemispora* should stand, with a position in the Ascomycetes.

In this regard, the organism described in this paper simulates closely characters attributed to *H. stellata.* After carefully comparing these characters with those of the monotypic

genus, *Hemispora,* it appears to the author that the fungus described in this paper has several differences which require for it a separate classification as a new species.

Hemispora coremiformis Moore, n. sp.

Growth in host of yeast-like cells 4–6 μ in diameter. On artificial media cultures show abundant mycelium of branching septate hyphae 2–4 μ in diameter, terminating in clavate, spherical or ampulliform cells (hemispores) 7–15 × 12–18 μ. Sexuality absent. Coremia formed on most solid media. Cultures stellate, vermiculate, coremiform, or cerebriform; color grayish-white, creamy-buff, light cinnamon, light Isabella. Cells of coremia 3–6 × 5–21 μ; large spherical cells 6–17 μ in diameter; conidia 4–6 μ in diameter; blastospores 4–6 μ (spherical), 4 × 6 μ (pyriform); spherical intercalary chlamydospores 6–10 μ in diameter, ovoid 8–9 × 12–14 μ. Echinulate spores resulting from apical cells of mature filaments 3–6 μ in diameter, in general 5 μ. Acid and no gas with l-arabinose, l-xylose, glucose, galactose, d-mannose, levulose, lactose, maltose. No acid or gas with rhamnose, saccharose, raffinose, amygdalin, salicin. Gelatine liquefies slowly, starting on the twelfth day. Litmus milk becomes acid and curdles starting on the third day, complete on the seventeenth day.

Hemispora coremiformis Moore, n. sp.

Mycelium in culturis abundans sed in hospite cellulae singulae diametro 4–6 μ sunt. Hyphae ramulosae septataeque, diametro 2–4 μ, cellulae terminales clavatae, sphericae vel ampulliformes (hemisporae) 7–15 × 12–18 μ. Sexus deest. Coremia in mediis solidiis. Culturae stellatae, vermiculatae, coremiformes cerebriformesve; color albidus, subalutaceus, dilute cinnamomeus vel dilute isabellinus. Cellulae coremiae 3–6 × 21 μ; conidia diametro 4–6 μ, blastosporae pyriformes, 4 × 6 μ; chlamydosporae, sphericae intercalarae diametro 6–10 μ, ovoideae 8–9 × 12–14 μ. Sporae echinulatae ex cellulis apicalibus hypharum maturarum diametro 3–6 μ generatim diametro 5 μ. Acidus in saccharo; "l-arabinose, l-xylose, glucose, galactose, d-mannose, levulose, lactose, maltose." Fermentatio nulla in saccharo; "rhamnose, saccharose, raffinose, amygdalin,

salicin.'' Gelatinum per duodecim diebus fluidificans. Lac concretus, acidum per tribus diebus absolute per septendecim diebus faciens.

SUMMARY AND CONCLUSIONS

1. A brief historical review of hemisporosis is given, with an abstract of an infection of the head occurring on a man in Costa Rica.

2. The organism exists as a yeast-like organism in the host and changes to a filamentous fungus on artificial media.

3. The microbe is characterized by the formation of coremia on most solid media, not on liquid media.

4. The mycelium consists of arthrosporoid cells, elongated forms and short structures which occur either as simple or branched filaments. These hyphae usually terminate in spherical or clavate cells, the protoconidia, which later divide to form deuteroconidia and develop echinulate spores.

5. The organism is described on several media, culturally and microscopically.

6. Gelatine is liquefied starting on the twelfth day.

7. Litmus milk is acidified and curdled starting the third day and completed on the seventeenth day.

8. Acid and no gas with l-arabinose, l-xylose, glucose, galactose, d-mannose, levulose, lactose, maltose. No acid or gas with rhamnose, saccharose, raffinose, amygdalin, and salicin.

9. As a result of the characteristics and properties of the organism, it is described as a new species of *Hemispora*, *H. coremiformis*.

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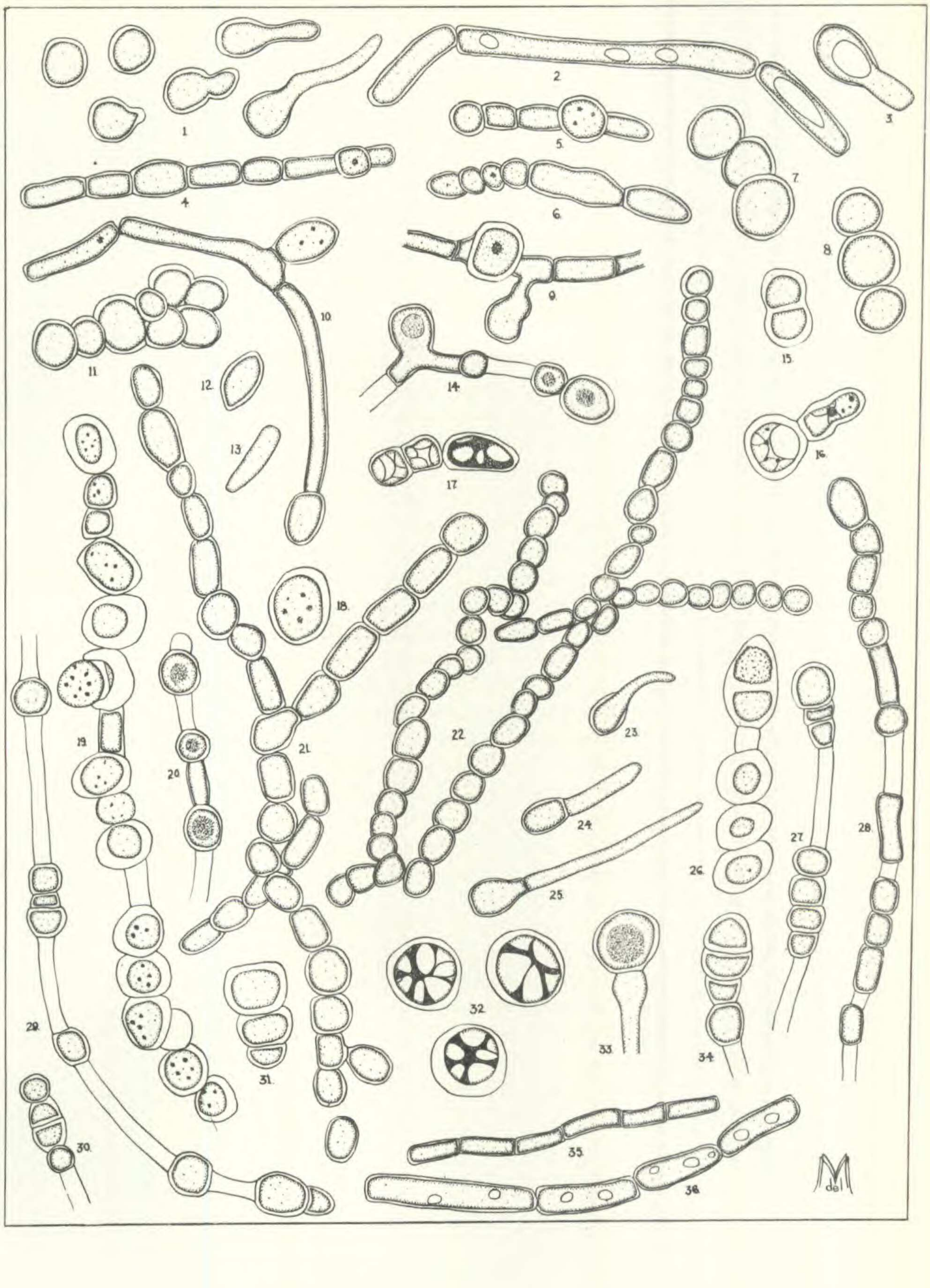
EXPLANATION OF PLATE

PLATE 9

Hemispora coremiformis

All figures drawn with the aid of a camera lucida at a magnification of × 1440 and reduced to approximately × 750.

Fig. 1. Group of yeast-like cells, first subculture on Sabouraud's agar.
Fig. 2. Filament in Sabouraud's broth.
Fig. 3. Germinating spore on Raulin's agar.
Fig. 4. Filament with chlamydospore on Raulin's agar.
Fig. 5. Filament with chlamydospore on Richards' agar.
Figs. 6–7. Type of cells on Raulin's agar.
Fig. 8. Oidia-like cells in Sabouraud's broth.
Fig. 9. Mycelium with chlamydospore and conidium on lactose agar.
Fig. 10. Hypha showing blastospores on Sabouraud's agar.
Fig. 11. Oidia-like cells on malt-extract agar.
Figs. 12–13. Types of cells on Raulin's agar.
Fig. 14. Type of mycelium in lactose broth.
Figs. 15–16. Hemispores on corn-meal agar.
Fig. 17. Cells mounted in lacto-phenol as fig. 16 from glycerine agar.
Fig. 18. Thick-walled spherical cell in Sabouraud's broth.
Fig. 19. Filament showing gelatinous secreted cells on wort agar.
Fig. 20. Mycelium on potato-dextrose agar.
Fig. 21. Mycelium on Richards' agar.
Fig. 22. Smaller cells as seen on Raulin's agar.
Figs. 23–25. Germinating conidia on Sabouraud's agar.
Fig. 26. Cells on malt-extract agar, showing a terminal hemispore heavily encased.
Fig. 27. Oidia-like cells separated by clear cells in lactose broth.
Fig. 28. Type of mycelium on Czapek's agar.
Fig. 29. Mycelium as fig. 27.
Fig. 30. Terminal cell condition of a filament on serum agar.
Fig. 31. Deuteroconidia formed on potato-dextrose agar.
Fig. 32. Group of spherical cells mounted in lacto-phenol from Sabouraud's agar.
Fig. 33. Terminal spherical cell on lactose agar.
Fig. 34. Terminal deuteroconidial condition on lactose agar.
Fig. 35. Hypha on glycerine agar.
Fig. 36. Hypha in Sabouraud's broth.



MOORE—HEMISPORA COREMIFORMIS

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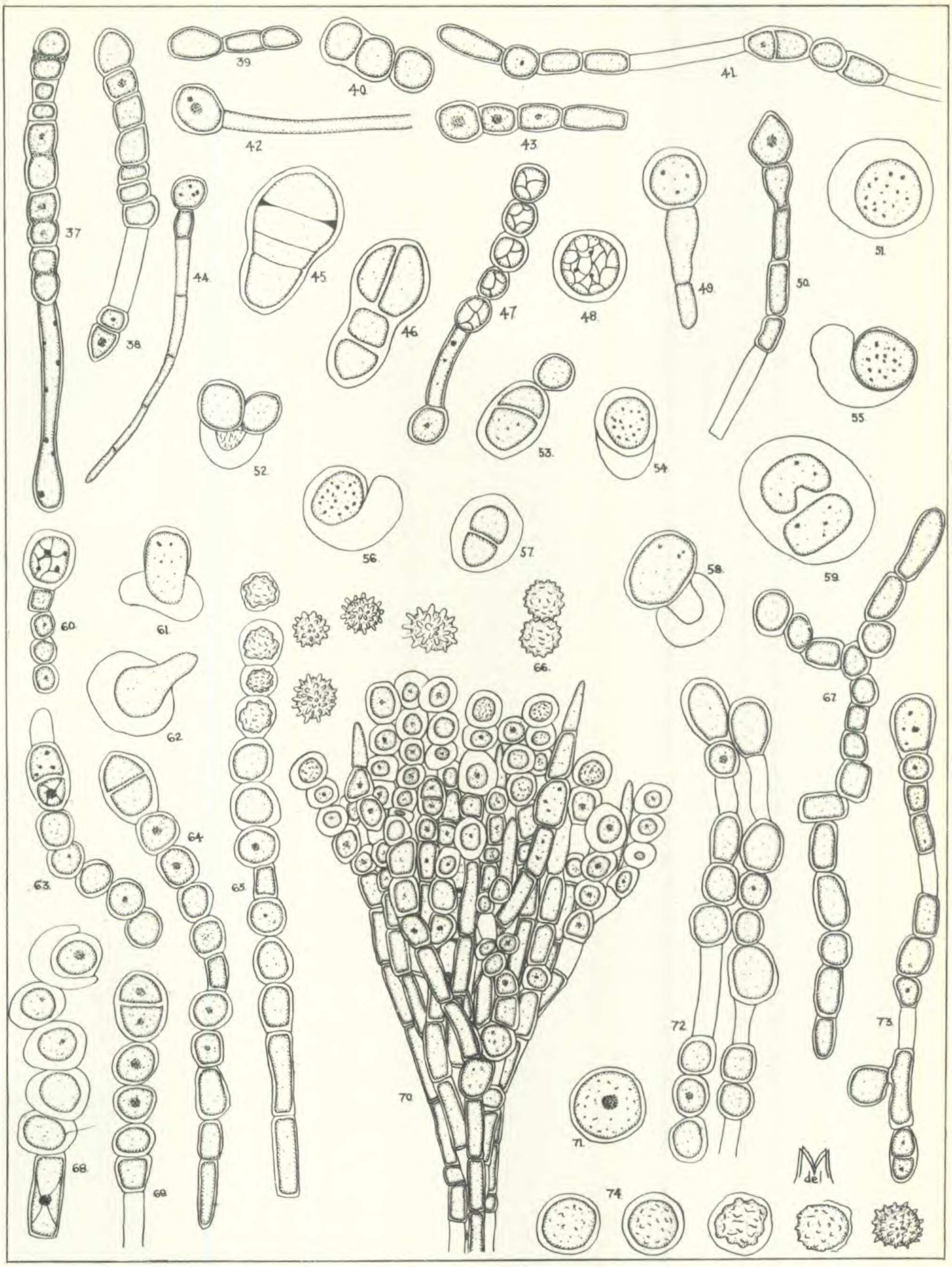
EXPLANATION OF PLATE

PLATE 10

Hemispora coremiformis

All figures drawn with the ai dof a camera lucida at a magnification of × 1440 and reduced to approximately × 750, except fig. 70, which was drawn at × 960 and reduced to × 510.

Fig. 37. Cross-wall formation in hypha in lactose broth.
Fig. 38. Mycelium on serum agar.
Fig. 39. Cells on Richards' agar.
Fig. 40. Hemispore on malt-extract agar.
Fig. 41. Mycelium on Richards' agar.
Fig. 42. Terminal spherical cell on potato-dextrose agar.
Fig. 43. Terminal cells on Raulin's agar.
Fig. 44. Young filament showing tapering of cells from a terminal spherical cell.
Figs. 45–46. Ampulliform cells on potato-dextrose agar.
Fig. 47. Deuteroconidial cells in Sabouraud's broth.
Fig. 48. Spherical cell in Sabouraud's broth mounted in lacto-phenol.
Fig. 49. Terminal spherical cell on malt-extract agar.
Fig. 50. Filament showing terminal cell condition on Raulin's agar.
Figs. 51–52, 54–59, 61–62, 68, 70. Cells on wort agar showing gelatinous secretion. Fig. 70 shows a coremium.
Fig. 53. Hemisporous condition on corn-meal agar.
Fig. 60. Terminal cells on Richards' agar.
Figs. 63–64. Mycelium showing terminal hemisporous condition on Richards' agar.
Fig. 65. Filament on malt-extract agar showing formation of echinulate spores from apical end.
Fig. 66. Adjoining echinulate spores formed from a hemispore on wort.
Fig. 67. Mycelium on Czapek's agar.
Fig. 69. Terminal cell condition on malt-extract agar.
Fig. 71. Spherical cell on Richards' agar.
Fig. 72. Filaments from a coremium on potato-dextrose agar.
Fig. 73. Mycelium on Czapek's agar.
Fig. 74. Series showing development of echinulate spore.



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